NFS/RDMA in Enterprise Linux

NFS Bake-a-thon, October 2014

Today's Take-away

- Stakeholders and implementations
- Current and new features
- NFS community resources
- Open discussion

What is NFS/RDMA?

- NFS on a low latency copy offload transport
- RDMA replaces sockets, TCP, IP under RPC
- No impact on performance of underlying persistent storage

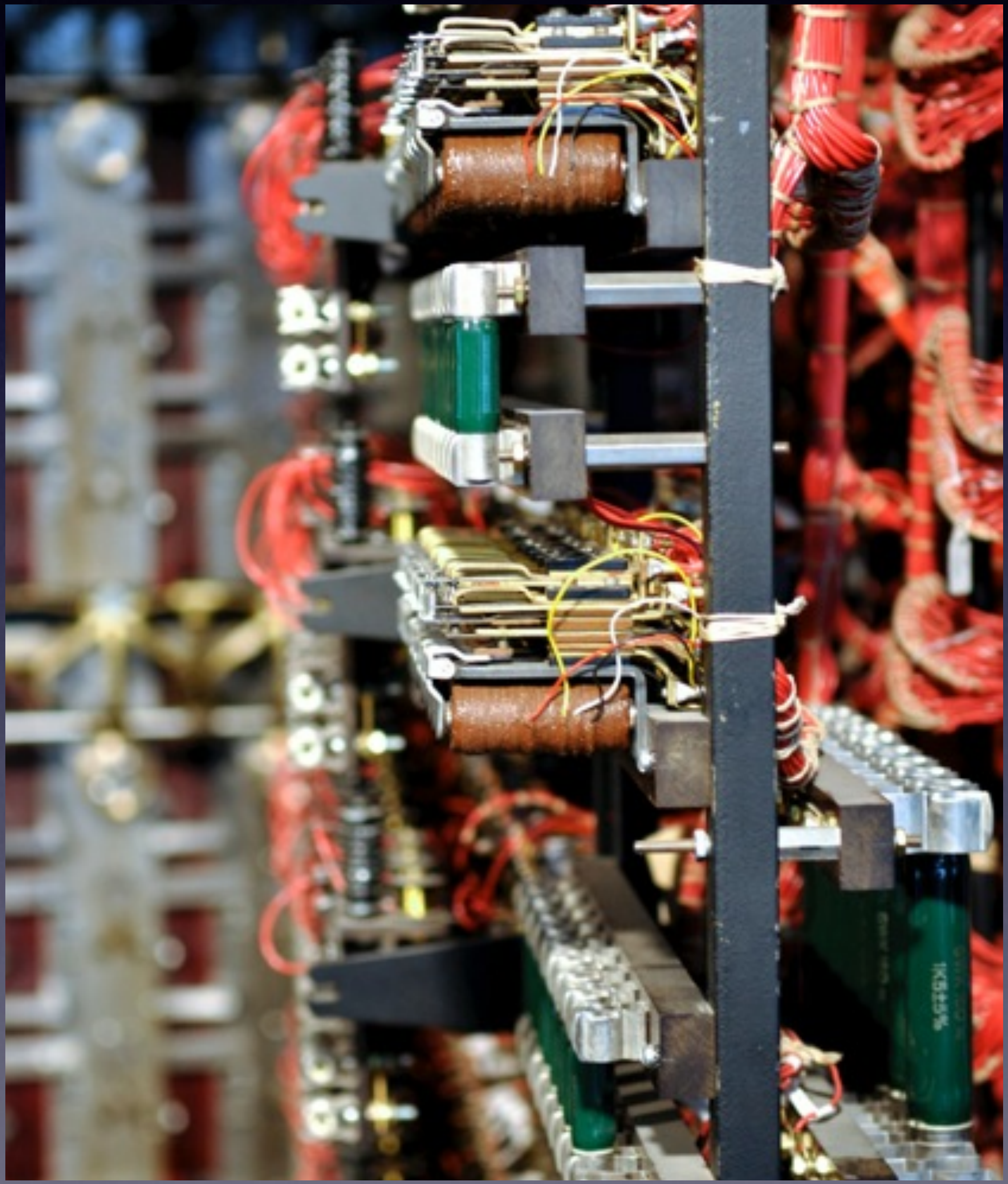
What Fabrics?

- InfiniBand
- RoCE (v1, v2)
- iWARP

Why Linux NFS/RDMA

Storage on RDMA

- NFS/RDMA
- iSER
- SRP
- SMB Direct



Trends

- More virtualization
  - Private: OpenStack, Exadata
  - Public: AWS, Google Cloud
- More unstructured block storage on NFS

Trends

- Persistent storage latencies going down
    - Think DRAM speeds
- Storage fabric latencies have to keep up

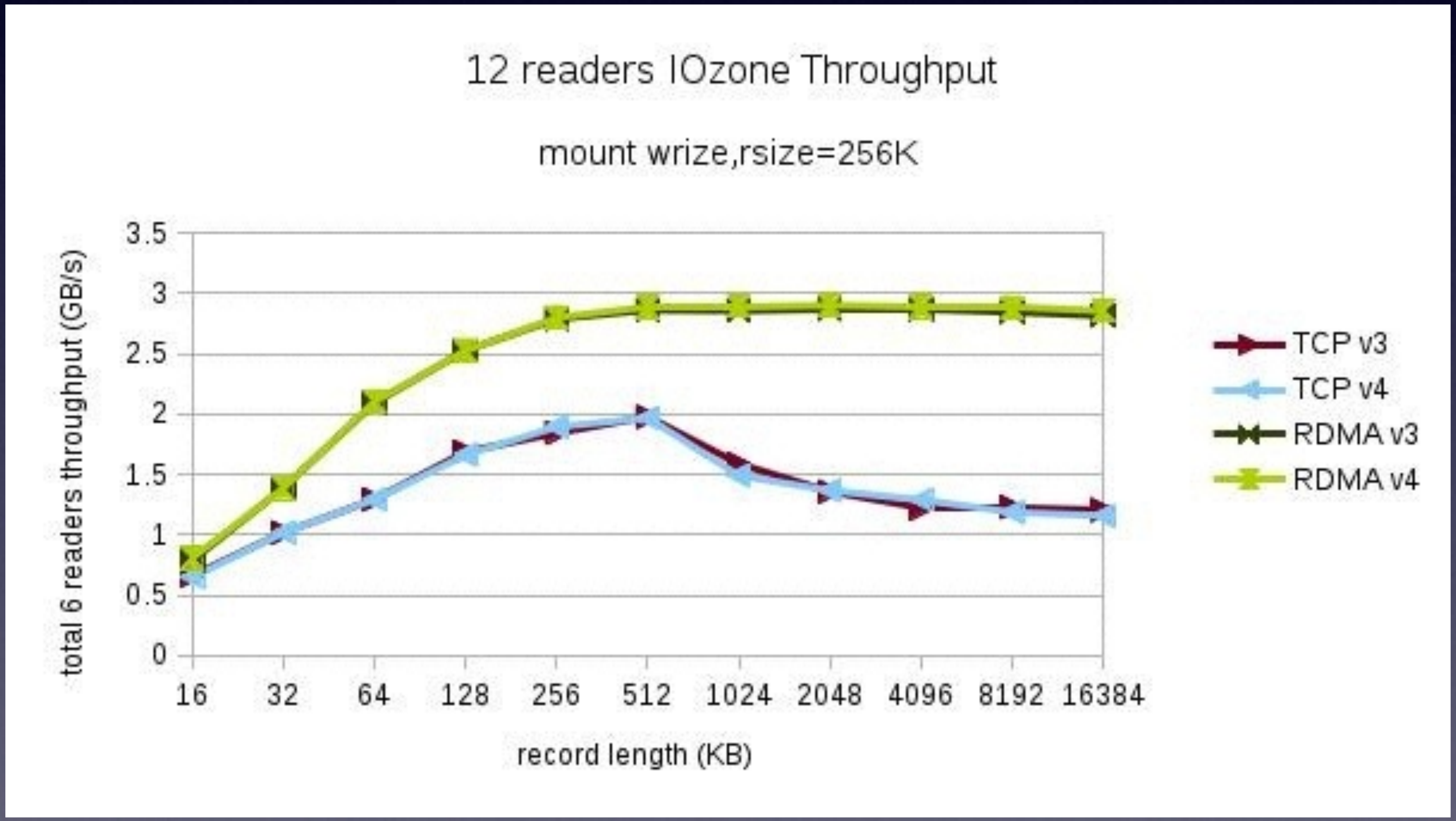
Customers

- Low latency required
  - HPC, Labs
  - Cloud back-end storage
- Fabric already present
  - Engineered systems
  - Data center

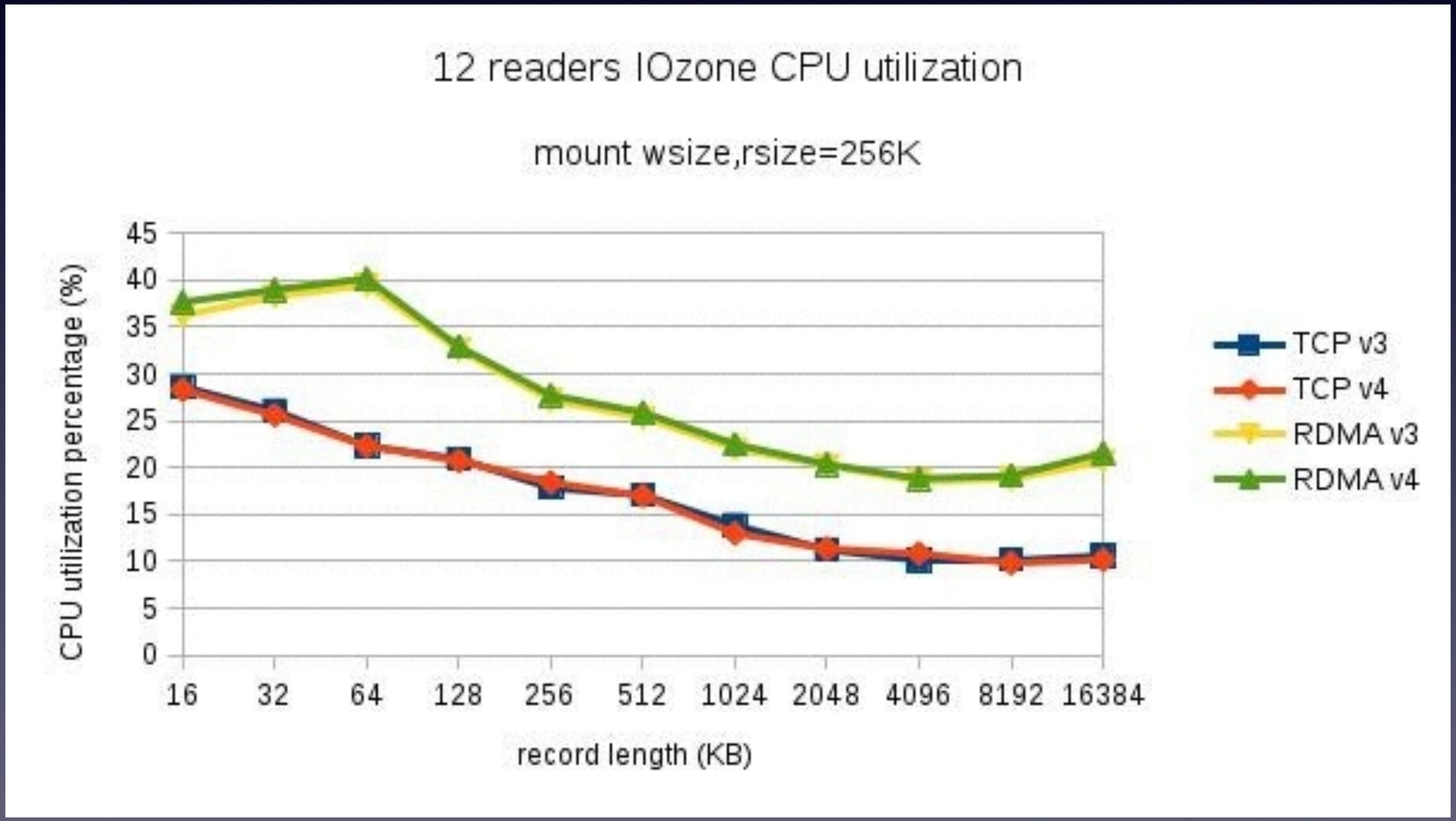
Linux Differentiators

- Market-leading NFS client implementation
- Penetration of HPC market
- Diversity of physical file systems
- iWARP / RoCE with NFS/RDMA

Reaches Link Speed



Low CPU Utilization



Community Snapshot

- Individuals
- Implementations
- Stakeholders

Coming Implementations

- Ganesha server
- VMware NFSv4.1 client
- Others?

Known Implementations

- Linux client and server
- Solaris client and server
- GlusterFS server (NFSv3)

Break

Back in 10 minutes

Enterprise Linux

EL Use Cases

- GlusterFS
- Ganesha
- OpenStack Cinder
- RHS
- Others?

Upstream Client Plans

- NFSv4.1 / pNFS
- Small I/O performance
- Scalability (NUMA, many mounts)
- High availability environments
- Adaptor hot-plug

Upstream kNFSD Plans

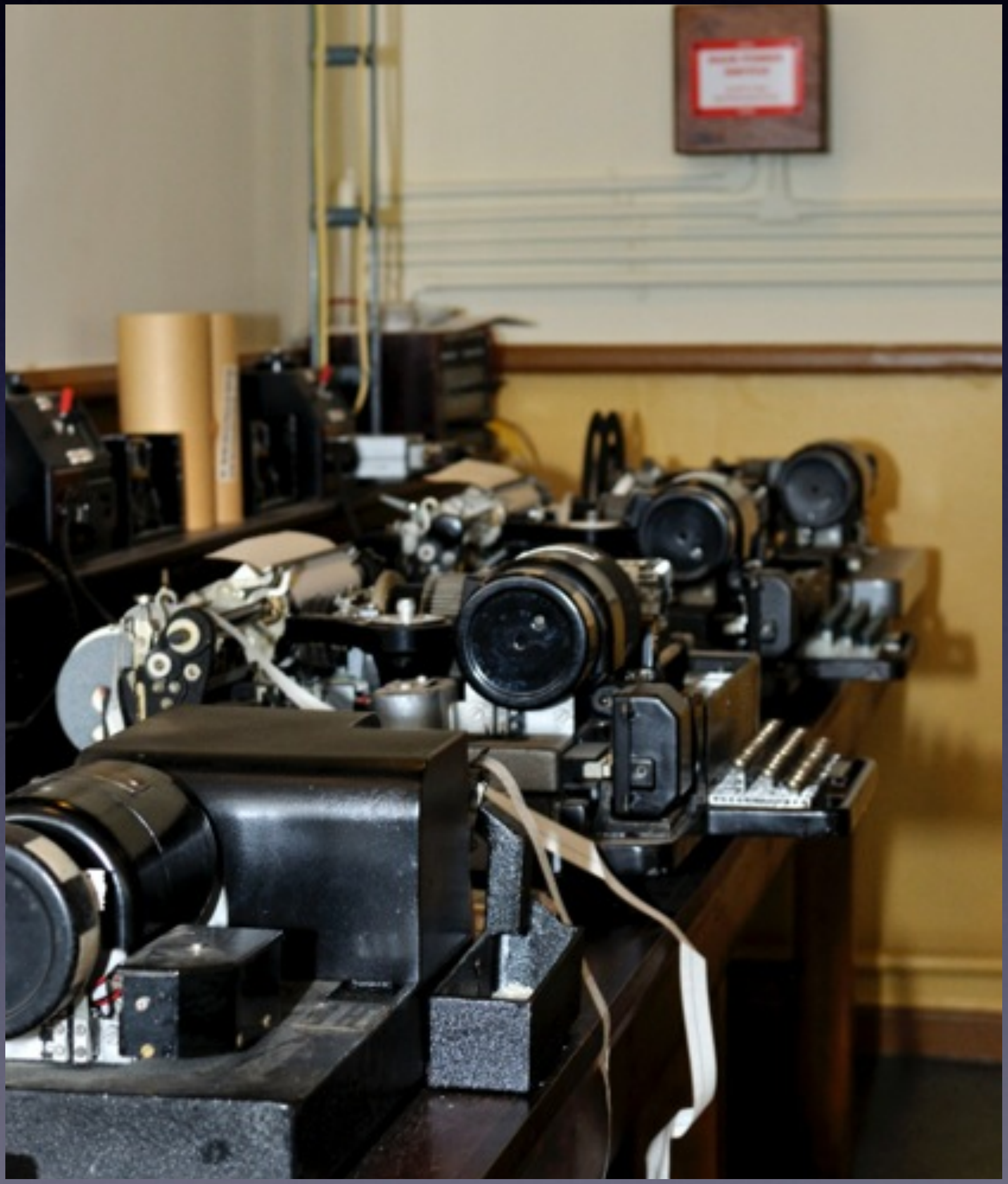
- kNFSD is a reference implementation
- Still missing a full-time subsystem maintainer

Troubleshooting Challenges

- ibdump - mlx4 only
- Wireshark - no RPC/RDMA dissector
- rpcdebug - known limitations

Enabling Full Support

- Q/A resources
- Hardware
- Engineering
- Community support
- Adapter diversity



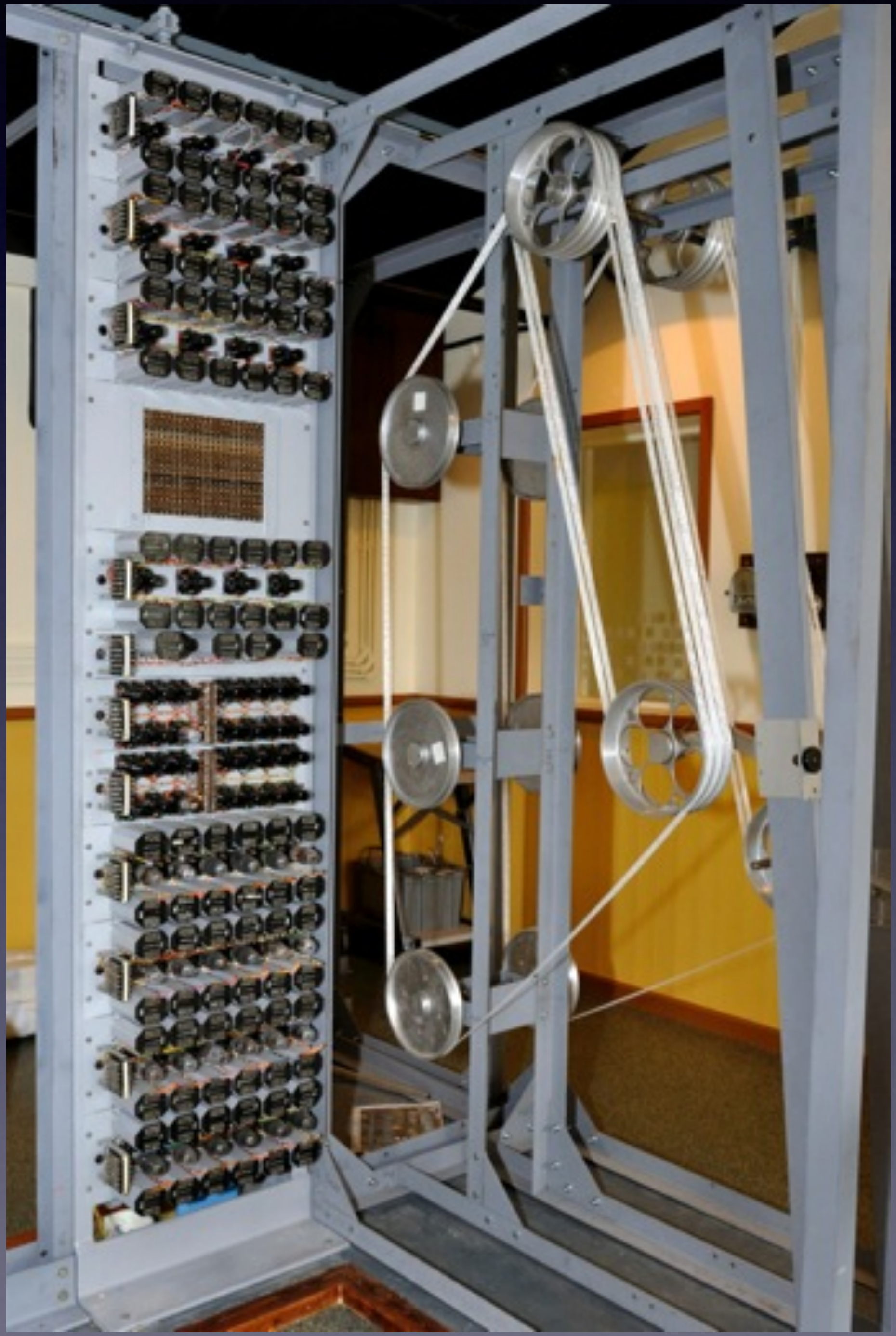
Break

Back in 10 minutes

Community Issues

Continuous Testing

- Functional tests
    - cthon04, xfstests
- Performance / stress
    - iozone, fio, dbench



Community Testing Events

- Are we ready for NFS/RDMA plug-fests?
- Infrastructure requirements: What fabrics?
- Additional testing events?
- New test software?

Protocol Enhancements?

- NFSv4.1
  - Backchannel
  - Credit limit and session slot table size
  - pNFS

Protocol Enhancements?

- Capability management
    - Inline buffer sizes
    - Server remote invalidation
    - Multiple QPs per transport

Protocol Enhancements?

- Multiple payloads per RPC
- Faster bring-up of new implementations

Open Discussion

Tirpitz Enigma - T244
The Tirpitz, or Enigma-T is a non-standard Enigma especially designed for use in communications between Germany and Japan during WWII. This machine is a variant of the Enigma-K and was supplied with eight rotors, each with five turn-over notches.
The Tirpitz was called "TIRPITZ" by the Germans, and spelled as "TIRUPITSU" by the Japanese.

Appendix